Small Business Innovation Research/Small Business Tech Transfer

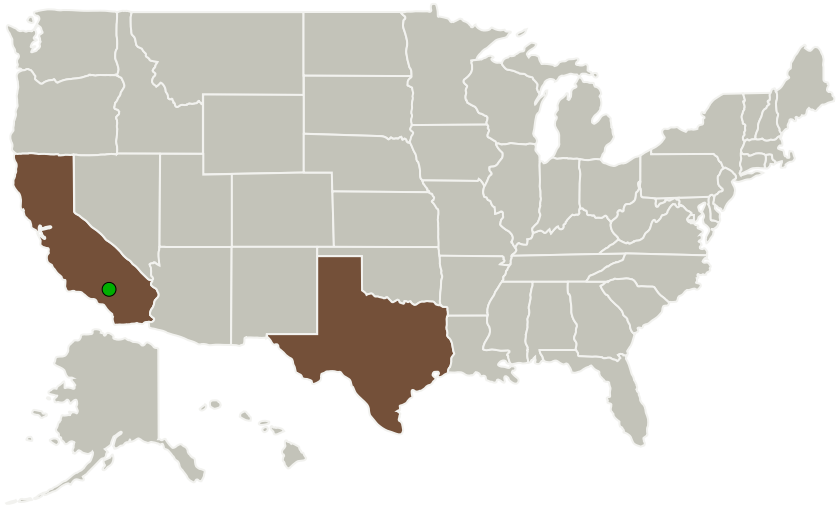
Dynamic Stall Flow Control Through the Use of a Novel Plasma Based Actuator Technology, Phase I

Completed Technology Project (2012 - 2013)

Project Introduction

Lynntech proposes a novel flow control methodology for airfoils undergoing dynamic stall. Dynamic stall refers to an aerodynamic phenomenon that is experienced by airfoils that undergo rapid changes in the flow angle of attack such as rotorcraft based airfoils, flapping wing technologies as well as fixed wing aircrafts undergoing sudden angle of attack changes. Dynamic stall is inherently an unsteady, non linear and complicated effect that can affect such flight parameters as lift, drag and airfoil stability. Lynntech, along with its STTR partner in Dr. Noel Clemens and Dr. Jayant Sirohi, at the University of Texas at Austin proposes to use novel pulsed plasma discharge based actuators for flow control on dynamically stalled airfoils. Lynntech has more than 20 years of experience with applied plasma physics and 10 years of experience with turbulent CFD modeling. Dr. Noel Clemens at the University of Texas Flow Imaging Research Laboratory in the Department of Aerospace Engineering, who has implemented and tested various types of plasma actuators for flow control. The proposed technology consists of pulsed plasma actuators which will induce high velocity airflow within the airfoil boundary layer, thus reattaching the flow. The proposed plasma actuator can achieve high Reynolds number (>5e6) flow control compared to contemporary dielectric barrier discharge plasma actuators without relying on corona discharge / hot plasma technology. Advantages of the system include low power consumption, ease of installation, increased flight stability, reduced drag and higher stall angles.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Lynntech, Inc.	Lead Organization	Industry	College Station, Texas
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California
The University of Texas at Austin	Supporting Organization	Academia	Austin, Texas

Primary U.S. Work Locations	
California	Texas

Project Transitions

February 2012: Project Start

February 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138111)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Lynntech, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

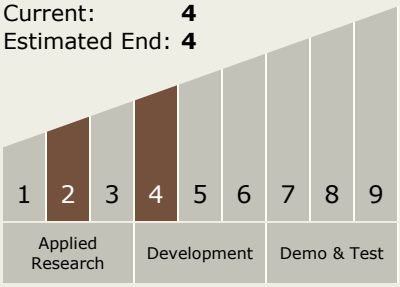
Carlos Torrez

Principal Investigator:

Ashwin Balasubramanian

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.5 Propulsion Flowpath and Interactions

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System